

Best practice fox management in Australia

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Abstract

Red foxes (*Vulpes vulpes*) impact on populations of many prey species in Australia, and so are the targets of widespread management programs. In this study we monitored fox management programs already operating across 4.5 million hectares of regional New South Wales (NSW) to compare the impact of varying fox baiting effort on the survival of lambs as a major prey species. The spatial coverage and frequency of fox baiting were both correlated with lamb survival. Lamb survival was higher in areas where fox baiting was done twice a year, in autumn and late winter/spring. Properties that had near neighbours participating in group fox baiting programs had higher survival of lambs than properties that did not. These results support the development of landscape-scale fox management programs, incorporating a high level of group participation to reduce the impact on vulnerable species.

Keywords: Australia, fox management, group control, predation, seasonal timing, *Vulpes vulpes*, 1080 baiting

Introduction

Since its establishment across Australia in the late nineteenth century, the European red fox, *Vulpes vulpes*, has been one of the most destructive introduced pest species, threatening the survival of many native animals as well as impacting on the livestock industry (Saunders et al., 1995). Poisoning, using 1080 bait is currently the most widespread and effective method used (Saunders and McLeod, 2007). Shooting and trapping, sometimes encouraged through the offer of bounties have historically been popular but are less efficient and cost-effective than poisoning. Exclusion fencing, den fumigation and destruction, and guard animals such as dogs and alpacas are also used.

A major research effort to develop an immunocontraceptive vaccine for fertility control could not overcome technical constraints associated with a product suitable for field release (Strive et al., 2007). Ongoing research efforts have been directed into registering a new toxin, para-aminopropiophenone (PAPP) and an alternative toxin delivery system, the spring-loaded M-44 mechanical ejectors (Marks et al., 2004, Marks and Wilson, 2005). Current research has also focussed on best practice programs to reduce fox impacts on both native wildlife (conservation programs) and livestock production. The culling of foxes reduces the impact of predation at a local level, however immigration, compensatory breeding and juvenile survival allow fox populations to recover quickly (e.g. Gentle et al., 2007). Hence there has been a movement towards landscape approaches with group participation to increase the effectiveness of fox management programs. Despite their popularity, there is little experimental evidence of their effectiveness due to the difficulty in conducting long-term, broad-scale ecological field experiments (McLeod et al., 2008; Rushton et al., 2006). This study was undertaken to determine if there was a correlation between the frequency and spatial coverage of fox control programs and the survival of lambs (McLeod et al., 2010).

Materials and methods

Experiments designed to detect the impacts of foxes require a large number of replicates to detect the relatively small effect (Greentree et al., 2000). This study took advantage of existing fox management programs on 5740 properties distributed across 4.5 million hectares in central west NSW to determine if lamb survival on a particular property was affected by fox baiting effort on that property or neighbouring properties. Initially we used the 'LambAlive' component of the 'GRAZPLAN' decision support system (Donnelly et al., 1997) to estimate the level of lamb mortality that was independent of predation. Resulting lamb survival figures were then analysed using a linear mixed effects model that incorporated the covariates of varying distance and times of neighbouring baiting, and the fixed effects of sheep breed, rainfall, year and season, their interactions, and individual property effects.

Results

Most control programs were conducted in early autumn, and late winter/ early spring, which coincided with the dispersal and breeding periods for foxes. The Sheep breed factor was found to be highly significant, along with three covariate interactions: i) baiting six months apart on the lambing property only, ii) near neighbour baiting just prior to lambing and baiting on the lambing property, and iii) near neighbours baiting both just prior to lambing as well as 6-9 months prior to the lambing. The model predicted significant increases in lamb survival of up to 20% could be achieved when all near neighbours participated.

Discussion

Landholders who participated with their neighbours in coordinated baiting programs were likely to have greater survival of lambs than landholders who did not. Furthermore, as the proportion of the adjoining properties that coordinate their fox baiting program increased, so did the survival of lambs on those properties. The frequency of fox control was also positively correlated with the survival of lambs even without neighbour support, with more frequent baiting (twice a year compared with once or no baiting) correlated with higher lamb survival. In Australia baiting of foxes is currently a valuable control tool to protect and improve the survival of species vulnerable to predation. Coordinated control of foxes over a large spatial scale and increasing the frequency of control to at least twice a year may further enhance protection by reducing fox immigration and any compensatory breeding and juvenile survival.

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